

THE OPEN METHOD IN THE TREATMENT OF POTT'S FRACTURE OF THE LEG.*

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Of the great variety of fractures the surgeon is required to treat, that known as Pott's fracture, because of its close relation to the ankle joint, may be considered among the most important. Indifferent results following fractures of the various long bones, while often unsatisfactory, do not necessarily incapacitate the individual. In the instance of the ankle joint, however, and the so-called Pott's fracture, a very trifling deviation from a perfect re-alignment, oftentimes—we may say always—works to the disadvantage and discomfort of the individual, by virtue of the constant and exacting use required of the joint. Thus it becomes imperative for the surgeon, not only to apply a perfected knowledge of the normal relations of the parts that he may correct the pathologic arrangement produced by the injury, but also to affect a return to the normal in such manner as will insure permanency until rendered unnecessary by natural repair.

Pott's fracture is by no means a recent conception, for so long as man has existed has he been heir to this injury. And our knowledge of its pathology has come down through the medical ages hand in hand with our knowledge of anatomy.

The injury, itself, is best described by the manner of its production. Eversion of the foot is necessary. The strain is first manifested in tension on the internal lateral ligament, either in the ligament itself, or its points of bony attachment. As is usual in the test between bone and ligament, the bone

*Read before the Academy of Medicine of Toledo and Lucas County, November 23, 1906.

gives way; affecting in this injury a separation of the malleolus, or a portion of it, from its parent body, the tibia. In addition, the tendon of the *tibialis posticus*, passing posteriorly and inferiorly to the malleolus, is not infrequently torn from its compartment in the annular ligament and displaced forward and upward. This is very important. The force continuing, pressure is exerted on the inner aspect of the external malleolus. This portion of the fibula being comparatively large and strong and, as in the case of the internal lateral ligament, the fibrous attachment of the fibula to the tibia even stronger, the stress is carried to the slender part of the fibula 7.0 cm. above the tip of the malleolus. This gives way, and in this manner is caused the second element of a Pott's fracture. If the force be great enough, the fracture of the fibula will be followed by a laceration of the inferior tibio-fibular ligament, or, more likely, a separation of the outer lip of the articular surface of the tibia. With the exceptions of the rupture of the annular ligament on the inner side of the ankle joint and the dislocation of the tendon of the *tibialis posticus*, this is what most authorities concede to be a typical Pott's fracture.

The philosophy of the treatment of this fracture is well understood and universally recognized, except by an occasional radical who advocates early passive motion and kindred methods. As advised by our fore-bears in practice, it consisted in reduction and the maintenance of reduction, and will always unalterably so be. It is axiomatic that injured nature demands rest, and given rest is amply able to care for herself. This is plain sufficient.

Methods and means of untold variety and quantity have been introduced from time to time. And it may seem strange, but the early methods have stood the test of experience. This is quite in contrast to the progress made in other lines of practice. There are two reasons for it.

First, and in the spirit of an eulogy for the grand masters of the past, the original basic principles, as worked out by them, were correct—reduction and fixation. The devices, which they in their ingenuity contrived, were as good for the maintenance

of reduction as external appliances well can be, and in their splints early was the acme of progress reached. Simplicity was theirs. Modern adaptations have not changed the principle of fixation, nor the means. They have merely served to complicate the appliance and incumber the injured leg.

Second, and with due respect, these cases are too often treated medically when they should be treated surgically. There is yet a pre-Lister fear advising against opening injured joints, or cutting down on broken bones. However, the trend of recent times, encouraged by asepsis and the now recognized natural immunity of tissues, is to operate. Kelly, Martin, Vaughan and others are doing this over a wide range of fracture cases. While not advocating the radical use of surgical treatment in all fractures, we do suggest it here as the best means to reduce, and to maintain the reduction of, the Pott's fracture.

The successful issue of a Pott's fracture depends very largely upon the return-ability of the broken tip of the internal malleolus to its original position, in perfect approximation to the tibia. The slightest bit of tissue intervening means imperfect apposition and consequently imperfect union. It is true there may result an apparently perfect union, but it is, in that event, fibrous, and a fibrous union in this location, bearing as it does its share of the strain imposed on the arch of the foot, will not stand the test of use. Supporting this is the lack of confidence in the closed methods of treatment as manifested by the text-books. They are full of suggestions for the correction of faulty unions.

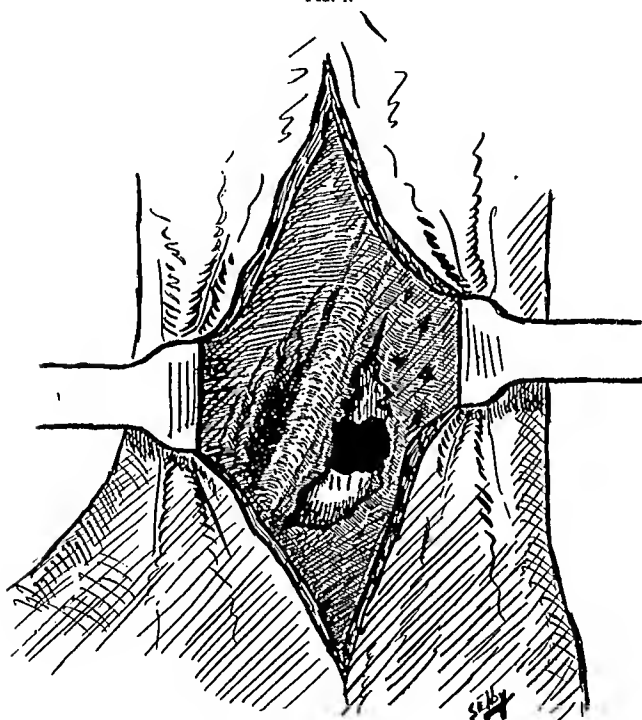
Not only is perfect union virtually insured when the fragments are sutured in place, but also the pain, so annoying to both patient and surgeon, in large measure prevented. In as much as this pain is due more to the impaling of nerve and muscle on the sharp points of fragments not wholly reduced than the trauma of the injury, this is consequently a very worthy argument in favor of the operative treatment.

The unfortunate and discouraging sequel of flat foot is obviated by the return of the tendon of the tibialis posticus to

its normal position in the annular ligament permitted by the open method.

Swelling is likewise largely done way with. Experience has demonstrated the very considerable hemorrhage a Pott's fracture induces in and around the joint, and it is reasonable

FIG. 1.



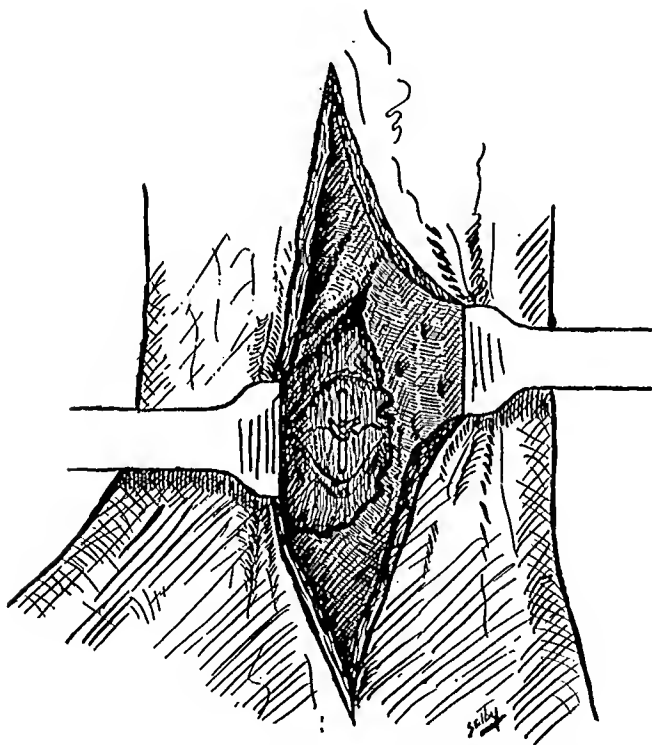
Shows forward displacement of the tendon of the tibialis posterior and the separation of the malleolus from the tibia.

to infer that swelling is consequent to this. It is a granted fact that increased tissue tension is an inevitable cause of pain. Likewise does it diminish the local resistance and hinder the natural power to heal. Hence, removal of the extravasated blood is indicated, and a judiciously—mark you, judiciously—

placed drain becomes a satisfactory adjunct to the suturing of the bones and the returning of the dislocated tendon.

In order to illustrate the desirability, we may say the necessity, of having an improved method for the treatment of

FIG. 2.



Shows the malleolus sutured in place, the tendon of the tibialis posterior being retracted.

the Pott's fracture cases, the two following reports have been abstracted from our records:

CASE I.—July 20, 1904, M. V. stepped on a round piece of iron which by rolling caused the ankle to turn. There was no apparent deformity, but passive abduction produced pain at the internal malleolus and demonstrated abnormal mobility. Pres-

sure over the fibula above the external malleolus caused pain, but elicited no crepitus. He was removed to St. Vincent's Hospital, where the usual fixation dressing was applied. At the end of six weeks and in spite of conscientious care, this ankle was found thickened and the arch of the foot fallen, with ankle and foot functions impaired.

CASE II.—January 5, 1906, J. S., age 24, had his left ankle squeezed between a falling timber and a large block of wood. He was immediately taken to St. Vincent's Hospital, and examined under ether anæsthesia. Fractures of both the internal malleolus and the fibula were easily demonstrated. Having reduced these fractures, fixation dressings were applied with the foot in marked inversion and adduction. At the expiration of eight weeks there was still considerable swelling, but there was apparently firm union. However, when put to the test, abduction was found to be discouragingly developed and the foot disgustingly flat.

The results obtained in these two cases are not rare. It is safe to assume that all surgeons of large experience have recorded on their history sheets cases of similar nature and like result. Nor should the blame attach to the operator; rather should we look to the method. With this in view, we began casting about for a method that carried with it a greater element of accuracy in the reduction of the malleolar fragment, for herein, may it be conceded, lies the fallacy.

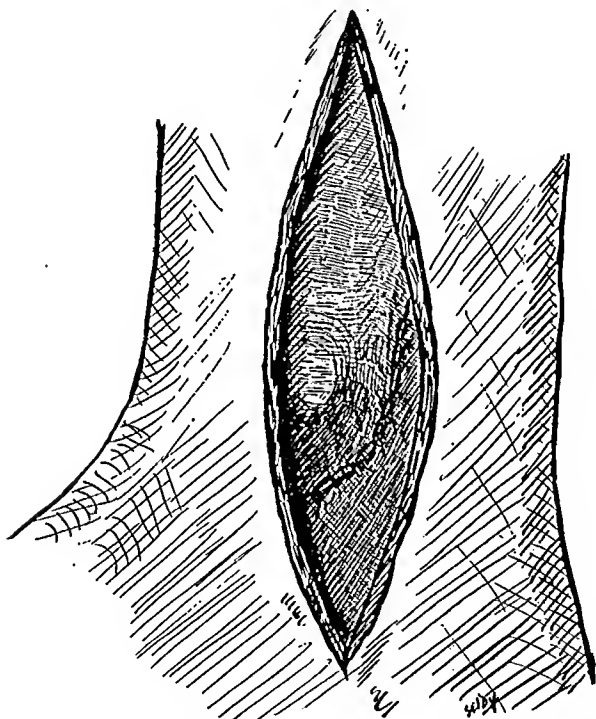
The growing popularity of the open treatment of fractures elsewhere, with apparently increasingly satisfactory results, determined its adoption in the treatment of our Pott's fracture cases. The first case so treated is detailed as follows:

CASE III.—June 29, 1906, J. S., age 64, while passing a moving crane, was struck on the outer aspect of the right leg just above the external malleolus by a large bar of iron. The result was an outward and backward displacement of the foot. A first aid dressing was applied at the plant and the man removed to St. Vincent's Hospital.

Examination.—Ether anæsthesia was employed and when fully established the temporary dressings were removed. The striking features were marked outward and backward displacement of the foot with a sharply defined prominence in the region

of the internal malleolus. This deformity served to draw the skin on the inner aspect of the ankle so tight as to render perforation by the sharp prominence beneath imminent. Palpation demonstrated this projecting bone to be the lower end of the shaft of the tibia with its fractured edge, from which the malleolus had been severed. The malleolus was found 4 cm. inferior and

FIG. 3.



Shows the suture of the annular ligament, which replaces the tendon of the *tibialis posticus*.

exterior to this edge, and freely movable. By some effort, the malleolus could be brought into its proper position, but would not so remain. The very considerable swelling about the ankle was regarded as being due to hemorrhage, and this was verified at the operation. The fibula was fractured 8 cm. above the tip of the external malleolus.

Operation.—The entire leg to the knee was prepared as for an abdominal operation, but with, perhaps, even greater care. The incision was made where best it would expose the malleolar fracture and was longitudinal, extending from the lower border of the malleolus upward over the shaft of the tibia to a point 5 cm. above the fracture. The skin proved to be the only sound tissue covering the bone at the seat of the fracture, and its incision was followed by a startling gush of blood, the accumulation within the joint. The joint having been emptied, bleeding was at no time excessive, though there continued rather free oozing from the lacerated tissues. That portion of the annular ligament through which the tendon of the posterior tibial muscle passes was torn from its bony attachments, permitting the escape of the tendon and its dislocation, if we may use the term, anteriorly. It was not necessary to develop the field, except for light retraction of the skin, which proved sufficient to expose the bony fragments. No effort was made to flush out the joint. In fact particular care was exercised that nothing should be brought in contact with the joint surfaces. The displaced malleolar fragment was brought upward into its proper position, and there held by an assistant. Holes were drilled in both the tibia and the malleolus, beginning in each instance in the middle of the exposed surfaces about 2 cm. from the line of the fracture and carried to the fractured surfaces to points well toward, but not involving, the articular surfaces. Through these holes a medium sized silver wire was drawn and the ends sufficiently twisted to make perfect the apposition of the malleolus to the tibia. Anticipating the possible necessity of removing these wires later, the twisted ends were not buried, but were permitted to remain accessible. The anatomical relations of the lacerated annular ligament were then reëstablished, using a running, over-cast suture of chromic catgut No. 1. Between the sutures and down to the bone, a roll of rubber dam was inserted for the purpose of twenty-four hour drainage. The skin was closed with the usual interrupted silk worm gut suture and a large bichloride dressing applied. The perfect reduction and retention of the malleolar fracture seemed to correct the fibular displacement, so the fracture of that bone was not treated by operating. The usual splints were applied.

Subsequent Course.—On the second day the drainage was removed. That the drainage had served its purpose was evi-

denced by the saturation of the dressings. In connection with this, it is interesting to note the patient had but slight pain, having passed a comfortable night.

On the seventh day the cutaneous stitches were removed, and at this time the patient was able to move the ankle quite freely and without pain.

During the fourth week, the patient complained of severe pain in the leg, which became quite swollen and hyperesthetic. The silver wire was apparently the source of this trouble as it promptly subsided on the removal of the wire. Some fear was entertained lest union prove lacking in firmness. This, however, was not the case, and the result was in no wise influenced.

By the sixth week, the man was bearing some weight on the foot, and by the eighth was walking about with a cane. Owing to his advanced age, we had some doubts as to the propriety of allowing him to do this, even though union was seemingly complete. However, no untoward result followed.

Condition at Time of Discharge.—September 11, 1907. The anatomical and functional results were perfect, as manifested by the ability of the old gentleman to walk without limping; and, furthermore, he was free from pain.

CASE IV.—Our second case is reported in abstract, chiefly for the sake of emphasis. Oddly enough, this was in a youth of sixteen years, quite in contrast to the age of the first patient.

July 10, 1906, R. C., age 16, had his right foot caught and twisted between two pieces of iron causing an outward and backward displacement. Examination under ether anæsthesia at the hospital demonstrated a typical Pott's fracture. After a careful preparation, an incision was made over the internal malleolus, disclosing a tear in the annular ligament with an anterior displacement of the tendon of the tibialis posticus and the separation of the malleolus from the tibia. The malleolus was restored and sutured with chromic catgut No. 4, the annular ligament with chromic catgut No. 1 and the skin with interrupted silk worm gut. A twenty-four hour drain of rubber dam was inserted between the stitches to the bone and a bichloride dressing of generous dimensions applied. The leg was placed in the usual fixation dressing. The convalescence was rapid and most satisfactory, and by the eighth week the young man had returned to his usual occupation.

Though we have other cases we have treated in this manner, and as satisfactorily as the two reported, we do not feel that the value of this paper would be enhanced by further details. We are frank to confess that the total number of our cases, were they tabulated, would make data far too meager to justify conclusions. Consequently, we present these two cases as a preliminary report, pending further investigation. There are, however, a few points relative to the method which deserve emphasis, and they are as follows.

The first is a word of caution concerning the preparation of the injured part for the operation, and we rather hesitate to speak of this as there is no surgeon who is not fully alive to the dangers of carelessly approaching joints. It were far better to have an occasional flat foot to one's credit than a single patient the amputation of whose infected limb became necessary to save his life. For such a weighty reason, we offer a rule, that if there be the least doubt as to the ability to secure an aseptic operation (under no circumstances operate outside of an operating room that is true and tried) do not operate. The preparation of the leg itself should be conducted with even greater care than that exercised in preparing the abdomen for operation. But these are well known facts, and extended reiteration is not necessary.

Our first case developed an interesting feature in the pathology of the fracture, and that is the displacement of the tendon of the tibialis posticus. It is a well known anatomical fact, that this muscle is one of the essential supports of the arch of the foot. Having been displaced to its pathological location in front of the malleolus, and this happens by virtue of the forcible change in location of the malleolus, the tendon lies lax, thus failing in its function. Its replacement by external manipulation is obviously impossible. This, of course, argues for the open method.

As to the material used in suturing the fragments, that is largely a matter of choice with the operator. The chromic gut seems to be sufficient, however, and has the added advantage of seldom being a source of subsequent annoyance.